

WHAT IS CLAIMED IS:

1. A method for performance management in a cellular mobile packet data network having a plurality of mobile stations linked to a plurality of base stations through a plurality of radio channels, the base stations being linked to a radio access network, and the radio access network being linked to a support node in a packet core network comprising the steps of

capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network; building a traffic and session database by parsing through the traces in order to extract and correlate all the information which is needed to the database;

defining a set of appropriate key performance indicators, which can be used to characterize the performance of cells in terms of user perceived quality of service parameters; and

calculating the above defined key performance indicators.

2. The method for performance management of claim 1, wherein the cellular mobile packet data network is a GPRS network.

3. The method of claim 2, wherein the step of capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network relates to Gb trace.

4. The method of claim 2, wherein the step of capturing raw traffic traces over standardized interfaces of the

operational cellular mobile data network relates to an encrypted Gb and Gr trace.

5 5. The method of claim 2, wherein the step of capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network relates to an encrypted Gb and a Gn trace.

10 6. The method of claim 2, wherein the step of capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network relates to a Gb, a Gi and a RADIUS trace.

15 7. The method of claim 2, wherein the step of capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network relates to an encrypted Gb, Gi, RADIUS trace and an {MSISDN, IMSI} list.

20 8. The method of claim 2, wherein the step of capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network relates to an encrypted Gb, Gi, RADIUS trace and a fractional Gn trace.

25 9. The method of claim 1, wherein the step of building a traffic and session database the database contains information about each and every user session and user transaction which happened during the measurement period.

30 10. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring MMS large message download/send rate in a specified cell.

11. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring WAP object download delay in a specified cell

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12. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring Web small object download time in a specified cell, where the size of a small object is about 9-11 kbyte.

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13. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring Web large object download rate in a specified cell, where the size of a large object is larger than 50kbyte.

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14. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring FTP download rate in a specified cell, where the size of the downloaded file is larger than 50kbyte.

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15. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring POP3, mail download time in a specified cell, where the size of the downloaded file is about 9-11kbyte.

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16. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring POP3, mail download rate

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in a specified cell, where the size of downloaded file is larger than 50kbyte.

17. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring end-to-end achievable throughput in a specified cell.

18. The method of claim 17, wherein the calculation of key performance indicator measuring end-to-end achievable throughput in a specified cell comprises the steps of:

calculating the total inbound traffic of the user, including other transactions, between the first data packet of the particular TCP connection and the acknowledgement of the last data packet of the particular TCP connection;

dividing the above bytecount by the time elapsed between the first and last inbound data packet.

19. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring the rate of TCP connections and stalled periods in a specified cell.

20. The method of claim 1, wherein the step of defining a set of appropriate key performance indicators comprises a key performance indicator measuring the user-perceived throughput history in a specified cell.

21. The method of claim 1, wherein the step of calculating the performance indicators is carried out by selecting an appropriate subset of the transactions in the traffic database.

22. The method of claim 1, wherein the step of calculating the performance indicators is carried out by calculating the key performance indicator value by summing the given Quality of Service measure of the selected individual transactions.

23. The method of claim 1, wherein the step of calculating the performance indicators is carried out by calculating the key performance indicator value by averaging the given Quality of Service measure of the selected individual transactions.

24. The method of claim 1, wherein the step of calculating the performance indicators contains the steps of

reading the next transaction record from the traffic and session database;

checking whether this transaction is of the type, which the KPI is about;

checking whether the transaction happened in the cell specified for the KPI;

calculating the quantity defined by the KPI for the particular transaction;

adding the value to an aggregation counter, and increase the counter calculating the number of eligible transactions for the KPI;

returning to the beginning until all the transactions are processed;

calculating the KPI value by dividing the value of the aggregation counter with count of the eligible transactions.

25. The method of claim 24, wherein the step of checking whether this transaction is of the type, which the KPI is

about is carried out by using the flow type field of the transaction record.

26. The method of claim 24, wherein the step of checking whether the transaction happened in the cell specified for the KPI is carried out by using the Cell Id field of the transaction record.

27. The method of claim 24, wherein the step of calculating the quantity defined by the KPI for the particular transaction uses the information elements of duration, timestamp of the first data packet, timestamp of the last data packet, packet count and loss count fields of the transaction record.

28. A system for performance management in a cellular mobile packet data network having a plurality of mobile stations linked to a plurality of base stations through a plurality of radio channels, the base stations being linked to a radio access network, and the radio access network being linked to a support node in a packet core network, a monitor node residing on a computer coupled to the network comprising:

means for capturing raw traffic traces over standardized interfaces of the operational cellular mobile data network;

means for building a traffic and session database by parsing through the traces in order to extract and correlate all the information which is needed to the database;

means for defining a set of appropriate key performance indicators, which can be used to characterize the performance of cells in terms of user perceived quality of service parameters; and

means for calculating the above defined key performance indicators.

29. The system of claim 28, in which monitor node comprising
5 a traffic and session database which correlates traffic and mobility information extracted from passively captured traces collected from standardized interfaces.

30. A computer program product for performance management in
10 a cellular mobile packet data network including a monitor node, comprising a computer readable storage medium having computer readable program code embodied in said medium, said computer-readable program code comprising:

computer-readable program code that captures raw
15 traffic traces over standardized interfaces of the operational cellular mobile data network;

computer-readable program code that builds a traffic and session database by parsing through the traces in order to extract and correlate all the information which is needed
20 to the database;

computer-readable program code that defines a set of appropriate key performance indicators, which can be used to characterize the performance of cells in terms of user perceived quality of service parameters; and

25 computer-readable program code that calculates the above defined key performance indicators.